

THE TROUBLE WITH TURBINES

Wind power generates electricity while reducing carbon emissions, but the spinning rotor blades pose a threat to raptors and bats.

Research and collaboration are helping reduce losses. **BY JULIE LUE**

The scene could be anywhere in central Montana. A rough-legged hawk cruises over an open field. A passing car on a dirt road startles a herd of pronghorn, which sprint a few hundred yards before stopping. On a nearby hillside, black Angus amble past a parked tractor.

But behind these cattle, on the lower slopes of the Highwood Mountains, giant wind turbine towers rise more than 20 stories above the surrounding landscape. Their immense white rotors, each as long as a football field, spin tirelessly in the stiff breeze.

Spion Kop Wind Farm, owned and operated by NorthWestern Energy (NWE), about 40 miles southeast of Great Falls near Raynesford, is one of a growing number of facilities putting Montana's infamous winds to work. As the United States pushes to reduce carbon emissions, the same winds that parch fields, fan wildfires, and blow blizzards are gaining attention as a valuable source of energy.

But that clean, green, renewable energy comes at a cost. The turbines' massive components must be built, transported, and installed—and then recycled or scrapped, as wind farms are eventually decommissioned or repowered (upgraded). Linking wind farms to energy markets may require building new transmission lines. And, of keen interest to biologists with Montana Fish, Wildlife & Parks, the construction and operation of wind facilities can displace terrestrial wildlife and kill birds and bats as they collide with the rotor blades, whose tips rip through the sky at up to 180 miles per hour.



SEEKING SOLUTIONS Right: Fairfield Wind Farm near Freezout Lake. As green wind energy production increases across Montana, utilities and wildlife agencies are working to find ways to reduce mortality of golden eagles (top) and hoary bats (above).

Fortunately, harm to wildlife can be significantly reduced, says Kristina Smucker, FWP Nongame Wildlife Bureau chief. The department has no regulatory authority over wind farms, but FWP and the Montana Natural Heritage Program have granular knowledge of local wildlife and habitats that wind developers and operators can use to create

less-harmful facilities. “Extensive research has given us a lot of tools to make sure wind and wildlife are as compatible as possible,” Smucker says.

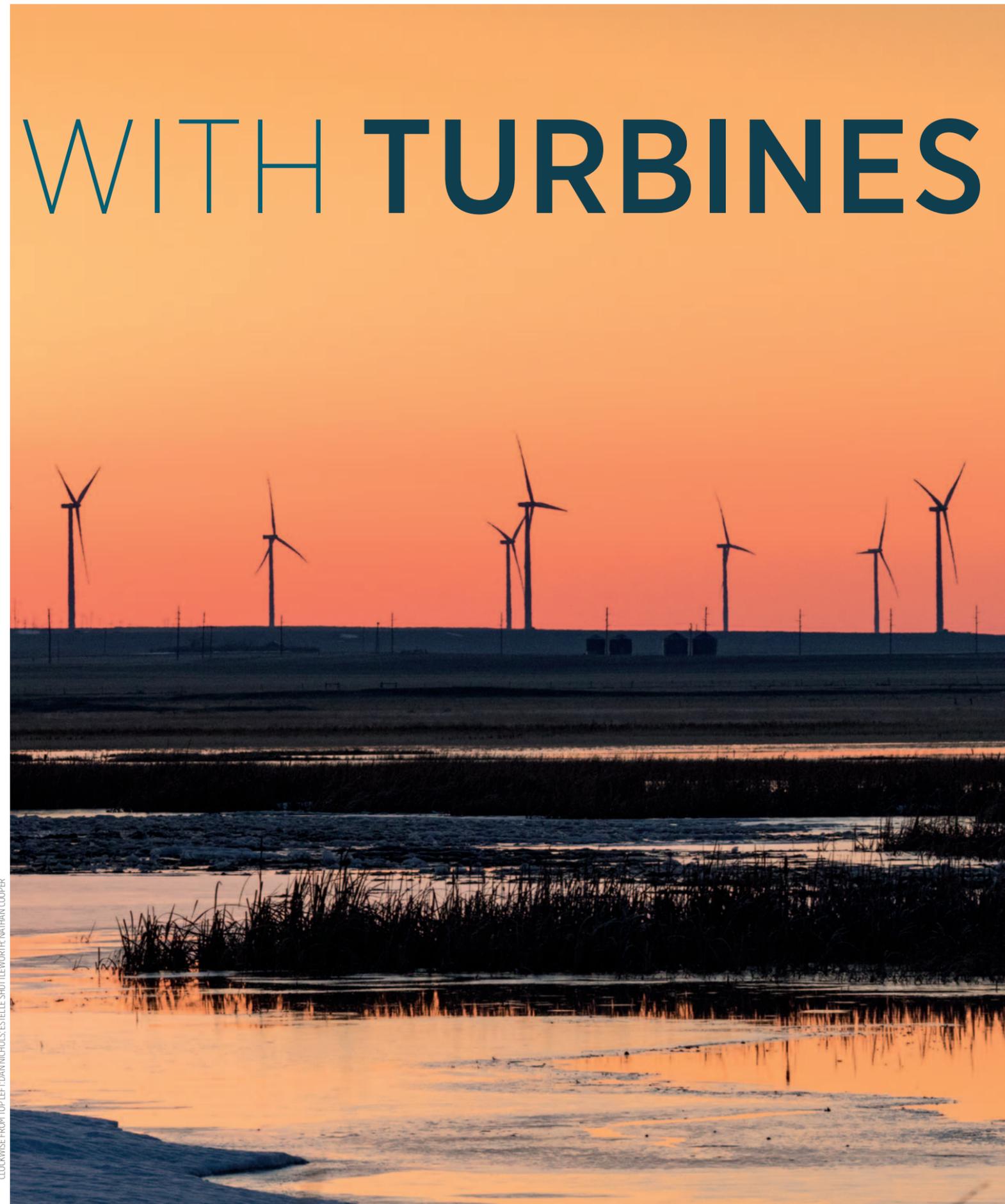
RAMPING UP

Montana's wind, dubbed “world-class” by the Oregon-based clean energy advocacy organization Renewable Northwest, ranks fifth nationwide for land-based wind energy potential, according to a report by the National Renewable Energy Laboratory (NREL). But Montana ranks only 21st among the 50 states for installed wind power capacity. We have the wind, but currently not enough turbines or transmission lines to take full advantage of it.

There's currently about 1.4 gigawatts (GW) of wind power capacity operating in the state, with another 4 GW or so in development. (One GW of capacity can power roughly 300,000 homes.) Some proposed projects may never break ground.

“Whether or not all of the projects under development come to fruition depends on a number of factors, including the cost of transmission interconnection and whether the project is selected as a finalist in a utility's request for proposals,” says Robin Arnold of Renewable Northwest. Still, there's plenty of interest in harnessing Montana wind to produce electricity, especially with the recent extension of federal renewable energy tax credits.

Most of Montana occasionally experiences tree-snapping, shingle-shredding gales, but profitable power generation requires more constant wind. Anyone who



CLOCKWISE FROM TOP LEFT: DAN NICHOLS; ESTELLE SHUTTLEWORTH; NATHAN COOPER



has spent time along the Rocky Mountain Front knows that the state's most consistently strong winds blow off the east face. Many wind farms are clustered along a line from Cut Bank south through central Montana. Eastern Montana is also seeing significant development, including the state's newest and largest wind facility, Clearwater, northwest of Miles City.

SMART SITING

Biologists don't know exactly how concentrations of wind facilities in central and eastern Montana affect all the wildlife that use these areas. But they do know that turbine blades kill birds and bats. And they know that choosing the right site—for wind farms or even individual turbines—can reduce mortality. In its voluntary guidelines for wind energy facilities, the U.S. Fish & Wildlife Service (USFWS) offers siting advice. The agency also recommends monitoring sites for two years before and two years after construction to predict and evaluate effects on wildlife. When wind developers consult with the USFWS in Montana, FWP biologists usually sit in, says Allison Begley, an FWP avian conservation biologist based in Helena.

Julie Lue is a writer based in the Bitterroot Valley.

“Research shows that bats may even be attracted to turbines.”

GATHERING INFORMATION

Right: An FWP researcher holds a live hoary bat found during a 2017 study at Spion Kop, 40 miles southeast of Great Falls. Top: Spion Kop this past winter.



Both wildlife agencies encourage utilities to keep wind farms away from intact native prairie, which provides important habitat for at-risk bird species such as ferruginous hawks, long-billed curlews, and Sprague's pipits. “We don't have a definitive sense of how these species will react to the building or presence of turbines, but they probably won't like it,” Begley says.

Wind farms built on agricultural or range lands don't fragment native grasslands, “and private landowners benefit from the leases,” Begley adds.

The wildlife agencies also recommend that wind energy developers pay close atten-

tion to how birds and other species use an area. “For instance, with eagles, we encourage companies during the planning phase to understand how the raptors use the area before they start construction,” Begley says. “It's pretty hard to put down a wind farm anywhere in Montana where eagles don't fly at least occasionally.”

Bald eagles are doing well overall in Montana and nationwide, their numbers tripling in the Treasure State since 1997. But according to a USFWS report, “The current rate of golden eagle mortality raises concerns as to whether [the population] can remain stable.” Threats to the raptors

FROM TOP: JOHN WARNER, MONTANA, FWP

HOW A WIND TURBINE SPINS—AND STRIKES

A typical wind turbine consists of three 100- to 150-foot-long blades affixed to a generator atop a 250- to 300-foot-tall tower rooted in an underground foundation. Between the blades and the generator, in a box called a nacelle, is a hub that collects the kinetic energy, which the generator converts to electricity.

Wind turbines situated in major migration routes or near nesting areas can kill eagles, other raptors, songbirds, and bats. The rotor blade tips can reach deadly speeds of more than 180 mph.

Power companies can lessen the harm by siting turbines away from migration routes and other areas heavily used by the birds, and by not spinning turbines during peak bat migration except when it's too windy at night for bats to fly. Some utilities install automated detection systems that stop the blades when flying wildlife approach, or use audible or ultrasonic deterrents. ■



PHOTO ILLUSTRATION BY LUCIE DURAN; WIND DATA: NATIONAL RENEWABLE ENERGY LABORATORY (NREL)

include illegal shooting, lead poisoning from bullet fragments when the birds scavenge big game animal carcasses, electrocution by power lines, and collisions with cars.

Now add wind farms. “Golden eagles seem more prone than bald eagles to collisions with turbines,” Begley says. One reason may be that golden eagles are more common along the Front and in central Montana, where most of the state’s roughly 800 commercial wind turbines are located.

Fortunately, there are ways to reduce collisions between eagles and turbine blades. “The best mitigation always happens before a build, when you’re looking at where eagles are most active—either nesting or migrating,” Begley says. “If energy developers do rigorous surveys to find out where the birds are frequently flying, they can use that data to build in the best, least-intrusive places.”

FIRSTHAND KNOWLEDGE

While risks to eagles and other raptors have been broadly publicized over the past two decades, birds aren’t the only winged wildlife species showing up dead at the base of wind turbines. Bats also are casualties. Unfortunately, monitoring before construction has not been as effective in predicting how the winged mammals will use an area once rotor blades start spinning. “Research shows that bats may even be attracted to the turbines,” Smucker says.

Biologists learned about the effects of turbines on bats and other wildlife at the 25-turbine Spion Kop Wind Farm, after NWE, the state’s largest utility, contracted the department to perform post-construction monitoring from 2015 to 2017. “If we build something, we want to build it right,” NWE biologist Sam Milodragovich told the *Great Falls Tribune* in 2017. “We want to know what the risks are and how we can minimize the impacts.”

Developers and operators generally hire private environmental consultants to conduct these studies. But Milodragovich, now retired, asked FWP to run the two-year study because all the data would remain in the public record (scan the QR code on page 34 to view the final report).

The advantage to FWP, Smucker says, was conducting a study that provided im-



“The best mitigation always happens before a build, when you’re looking at where eagles are most active—either nesting or migrating.”



DATA DRIVEN Inverenergy constructs a wind turbine near Judith Gap; golden eagle nest; a raptor soars past a wind tower at Spion Kop. Energy companies use FWP data to keep sites away from migrating or nesting areas.



portant information on wildlife and wind turbines. “And for Sam, it was also a logical continuation of his tireless work to make energy production and transmission safer for wildlife—especially raptors.”

Milodragovich worked for more than two decades to protect raptors and other birds from being electrocuted by or colliding with the utility’s power lines, Smucker says. “He pushed to identify and retrofit power poles that were the worst offenders, even going so far as to help train engineers and linemen. And he’s a big reason people now see ospreys nesting on platforms next to power poles across Montana.”

During Milodragovich’s tenure, NWE installed statewide more than 150 such platforms, which allow ospreys to nest next to potentially deadly power poles instead of directly on top. “He was also one of a small number of early advocates who pushed to make wind development more compatible with raptors,” Smucker adds.

At Spion Kop—named for a nearby ridge that resembles a notable site from the Boer War in South Africa—FWP biologists monitored wildlife use on lands at and surrounding wind turbine locations. They also looked for bird and bat carcasses below the structures and estimated total deaths per turbine.

The two-year study showed that few birds were killed by the Spion Kop turbines. No dead raptors or threatened or endangered species were found. But bat mortality was higher than expected when compared to that at other wind farms in Rocky Mountain states. Some bat species fared worse than others.

Of the nine species that used the Spion Kop area, just two accounted for all 61 dead bats found on-site. More than 70 percent were hoary bats, a relatively large bat with white-tipped brown fur that is a Montana state species of concern. The rest were silver-haired bats. Both are migratory tree-roosting species that also make up the bulk



NEW TECH FOR A NEW GENERATION NWE biologist Sam Milodragovich speaks with Montana students about protecting birds of prey. Now retired, Milodragovich was instrumental in helping the utility reduce raptor mortality. The biologist notes that new technology such as thermal-imaging cameras mounted on wind turbines (above right) monitor bird and bat activity and automatically record the data to a computer in the turbine.

of bat deaths from wind turbines elsewhere in the United States.

FWP officials emphasize that estimating the number of bats killed by turbines is more complicated than simply tallying the number of carcasses found on the ground. “To figure out bat fatality rates at Spion Kop, we had to adjust the raw counts by factoring in our efficiency in finding carcasses and the amount of time carcasses persist before being scavenged,” Smucker explains. “We estimated that 163 bats were killed during fall migration at that facility.”

Bat fatality rates vary among wind facilities. At the 90-turbine Judith Gap Wind Farm, studies conducted in 2006-07 and 2009 estimated that a total of 925 bats were killed

during spring and fall migrations combined.

Bats play a crucial role in ecosystems, devouring vast numbers of insects like cutworm moths and mosquitoes that plague crops and humans. “Bat researchers are concerned that if current fatality rates continue, species such as hoary bats could be listed under the Endangered Species Act,” Smucker says. Allowing populations to decline to that point would not just be bad for the bats; a federal “threatened” or “endangered” designation would also create complex regulatory headaches for wind farm operators.

LIFE-SAVING CHANGES

Can Montana produce more clean wind power while killing fewer bats? A combina-

tion of local data and knowledge gained from other wind facilities, including some in Alberta, suggests that it can.

At Spion Kop, bats are much more likely to collide with turbines during peak migration in August and September. What’s more, acoustic monitoring studies conducted throughout Montana show that bats don’t fly during windy nights. Armed with that information, in 2020 FWP released its voluntary recommendations for reducing bat deaths at wind farms. A key suggestion is to increase “cut-in” speeds—the wind speed at which blades start to spin and turbines begin generating power—at night during August and September. During these times, the blades wouldn’t start spinning



REDUCING EAGLE MORTALITY

Bald and golden eagles receive special protection under the Bald and Golden Eagle Protection Act (BGEPA), as well as that afforded most other bird species under the Migratory Bird Treaty Act. Under the BGEPA, it’s illegal to accidentally kill or “take” an eagle, unless an entity has an “eagle take” permit. This federal permit allows a specified amount of eagle mortality without penalty as long as the permit holder takes certain steps to protect the birds and, in some cases, mitigate deaths by taking protective actions elsewhere—like by retrofitting power poles. “It’s the same principle as a carbon offset program,” says Dr. Marco Restani, NorthWestern Energy wildlife biologist. “If an industry is substantially polluting somewhere, they can buy carbon offset credits somewhere else, but in this case it’s with eagles.”

For their part, some wind power companies have installed automated detection systems that turn off turbines when eagles are flying nearby or use audible repellents that scare raptors away. “The detection systems and other sophisticated technologies are being used by more and more facilities to lessen risk to eagles,” Kristina Smucker, FWP Nongame Wildlife Bureau chief, says. “At some facilities, they actually have employees who watch for eagles, pretty much constantly.” ■

IdentiFlight systems can detect a bird as far as one kilometer away and identify it as a protected species such as an eagle.



until it's windy enough to discourage bats from flying. Elsewhere, this "curtailment" strategy has been shown to significantly reduce bat deaths with just a small decrease in power generation.

During August and September 2020, NWE adopted the curtailment strategy at Spion Kop and its other Montana wind facility, Two Dot, and again in 2021 and 2022. According to Dr. Marco Restani, NWE biologist, the utility increased evening cut-in speeds at Spion Kop and Two Dot from August 1 through September 30 to a level that, according to model results, avoids 90 percent of bat activity.

Smucker says adaptations like these are encouraging. "The NWE modifications are good news for bats, and something we hope more wind facilities will consider."

COOPERATION AND COMMUNICATION

Citing threats to wildlife and habitat from rising global temperatures, many conservation groups agree that resolving wildlife issues with wind generation is worthwhile. In a joint issue brief, the National Wildlife Federation and the National Audubon Society stated, "Responsible wind power is a key solution to addressing the threat of climate change to people and wildlife."

Helena-based attorney Chuck Magraw,



ONE OF 61 FWP wildlife technicians document a bat carcass found at NWE's Spion Kop Wind Farm during a two-year study.

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ACCOMMODATION Above: NWE wildlife biologist Dr. Marco Restani says the state's largest utility is adjusting its power generation to accommodate bats and avoid 90 percent of bat activity. Right: A wind turbine at night.



a consultant for the Natural Resources Defense Council, says, "Runaway climate change, which a decarbonized energy system will prevent, poses a far, far greater threat to wildlife than wind power development."

But these organizations also agree that wind facilities must be designed and operated in ways that don't threaten wildlife, "especially birds and bats," says Montana Audubon executive director Larry Berrin.

Magraw says cooperation is key. "What is critical is communication and collaboration between the wind power industry and

governmental entities as well as with non-governmental organizations that know the landscape."

Smucker and other FWP officials encourage wind developers to reach out to the department early in their planning stages. "We know that more wind development is coming to Montana, and we want to see it done in a wildlife-friendly way," Smucker says. "Sure, there are challenges to making that happen, but there are also reasonable solutions to those conflicts if everyone sits down and talks them through." 🐼



BIG TASK Left: A turbine blade is transported to a wind farm for final assembly. As more farms are built, utilities and wildlife officials will need to cooperate to ensure that bats and eagles don't become green-energy casualties.



Read the FWP report "Post-Construction Studies for the Spion Kop Wind Farm Project in Judith Basin County."

CLOCKWISE FROM ABOVE: LEFT: NORTHWESTERN ENERGY; KEN CONGER; SHUTTERSTOCK; MONTANA FWP